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B2P P10B2A3

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(54) Abstract Title

Upright-type vacuum cleaner having a removable cyclone dust collecting apparatus

(57) An upright-type vacuum cleaner includes a cleaner body 10 having a dust collecting chamber 11 and a motor driving chamber 13, a suction brush 15, and a cyclone dust collecting device 17 removably mounted in the dust collecting chamber. The cyclone dust collecting device includes a cover, first (30) and second (4) cyclone bodies for centrifuging and collecting contaminants entrained in the air, a lower door (50), and an outlet pipe (60). The second cyclone body includes a grille having a plurality of perforations formed therein to filter out small particle contaminants. The lower door is removably mounted on a lower end of the first cyclone body, and the outlet pipe discharges the clean air. The cyclone dust collecting device 17 prevents a back flow of contaminants thereby collecting contaminants more effectively.

A further invention is disclosed of an upright type vacuum cleaner having a cyclone dust collecting device removably mounted in the dust collecting chamber 18, whereby a dust collecting receptacle (90) is removably disposed in the cyclone body.

FIG.1

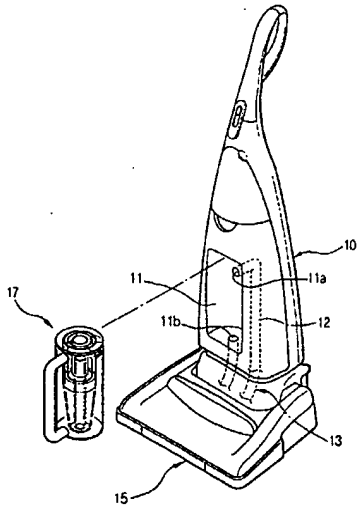

FIG.4

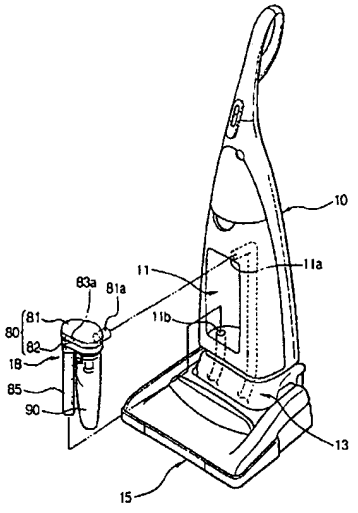

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FIG. 1

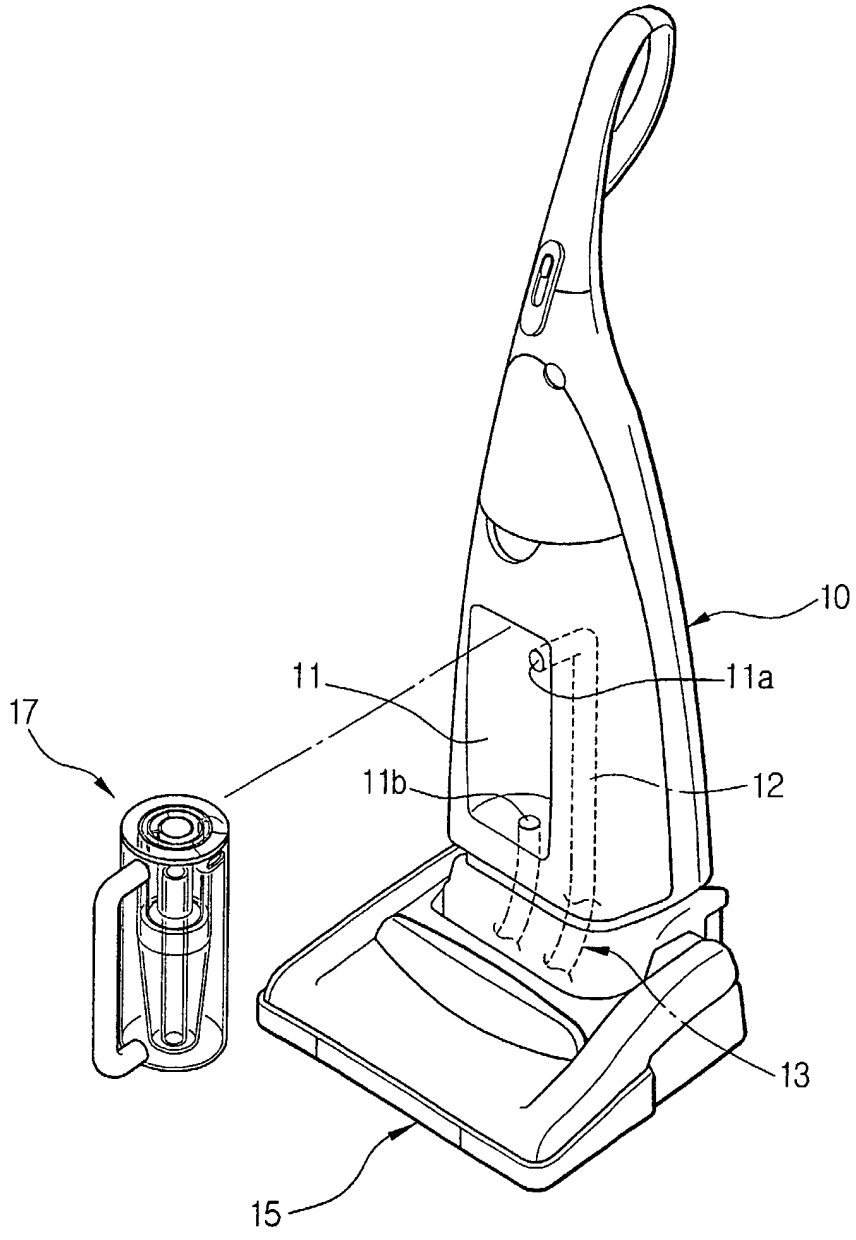


FIG.2

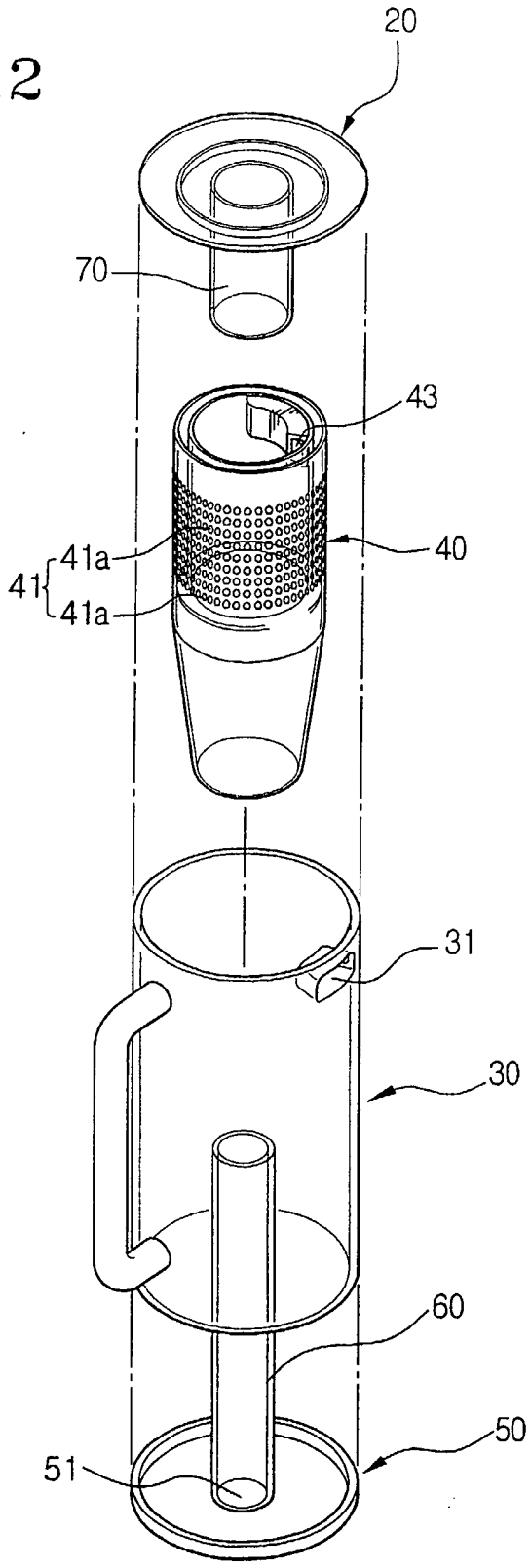


FIG.3

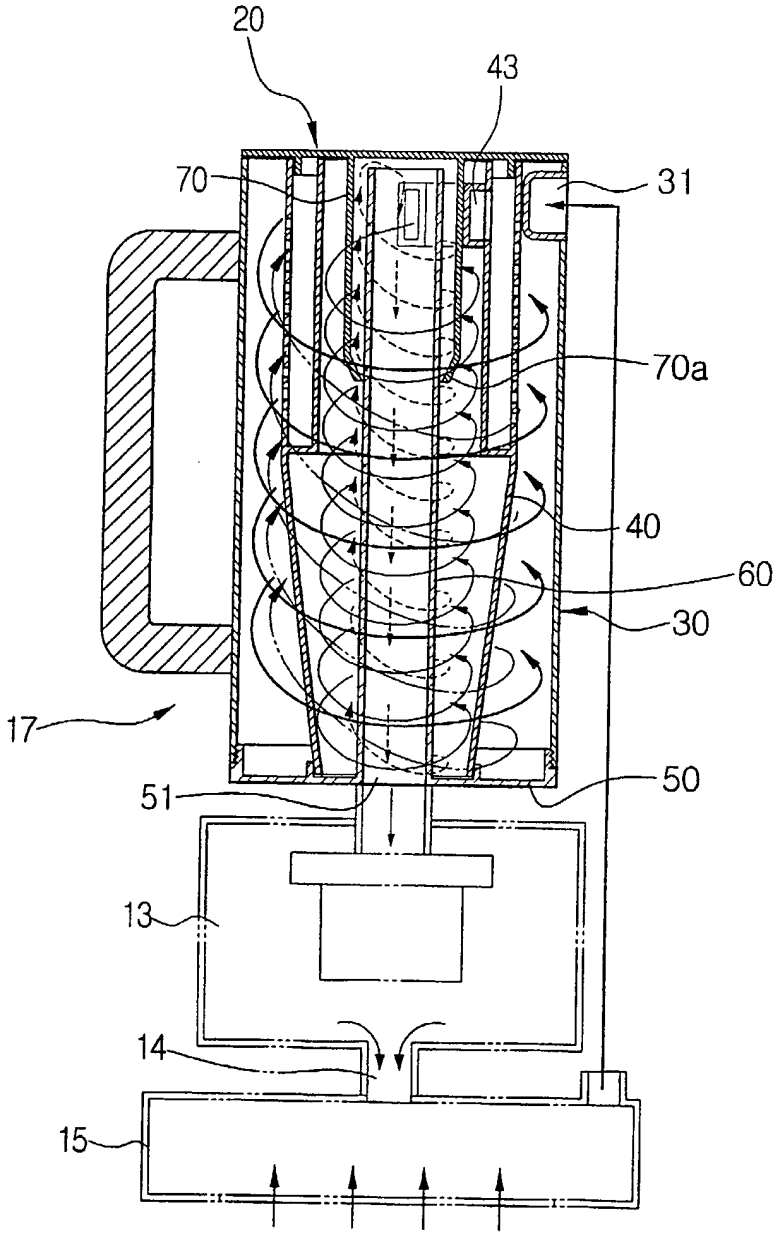


FIG.4

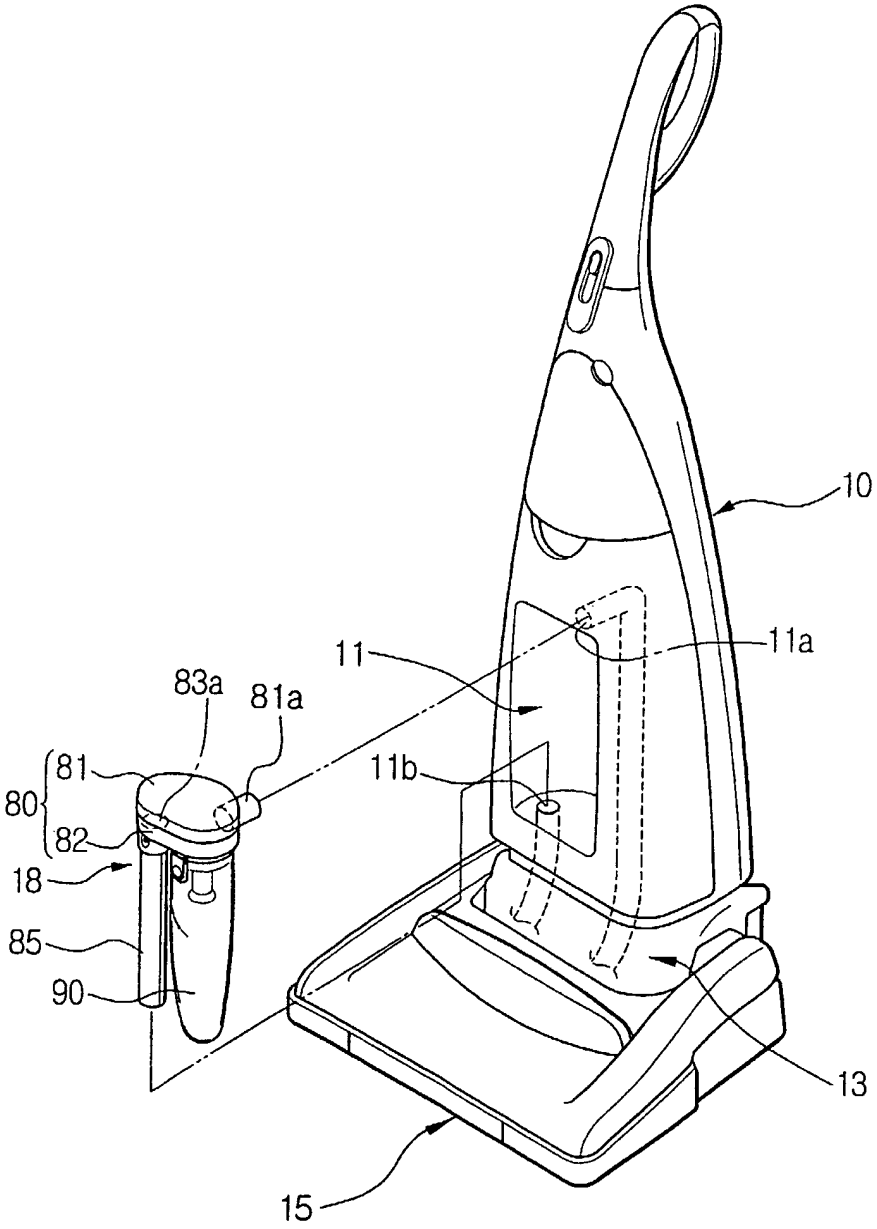
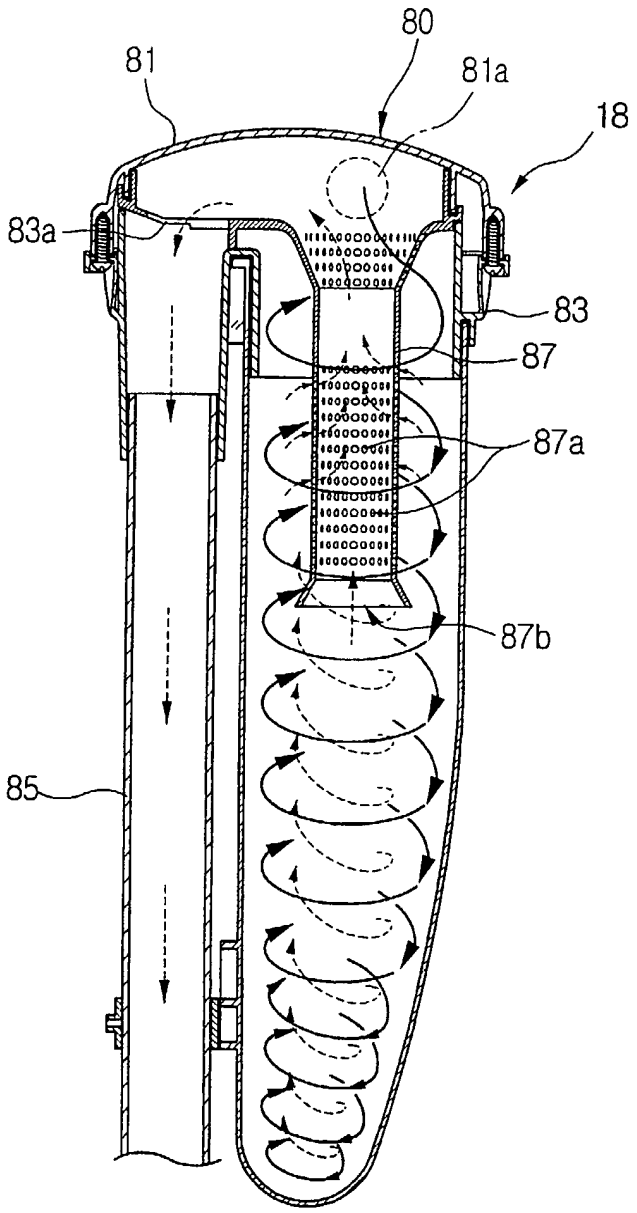


FIG.5



UPRIGHT-TYPE VACUUM CLEANER HAVING A CYCLONE DUST COLLECTING APPARATUS

The present invention relates to an upright-type vacuum cleaner, and more particularly, to an upright-type vacuum cleaner having a cyclone dust collecting apparatus for separating and collecting contaminants that are entrained in the air sucked through a suction brush of the cleaner.

Generally, an upright-type vacuum cleaner has a suction brush that is movably connected to a cleaner body. The suction brush moves along the cleaning surface during the cleaning process. The cleaner body has a dust collecting chamber and a motor driving chamber. A dust filter is removably disposed in the dust collecting chamber, and a motor is disposed in the motor driving chamber.

When the motor operates, it generates a strong suction force at the suction brush. The suction force draws contaminants entrained in air on the cleaning surface through the suction brush and into the cleaner body. The air is then discharged through a dust filter disposed in the dust collecting chamber of the cleaner body. The contaminants entrained in the air are collected by the dust filter, and the clean air is discharged into the outside atmosphere through the motor driving chamber.

A conventional upright-type vacuum cleaner collects contaminants by using an expandable dust filter. When the dust filter is full of contaminants, the dust filter must be replaced manually. Manual replacement of the dust filter is inconvenient and unsanitary.

According to a first aspect of the invention, an upright-type vacuum cleaner comprises: a cleaner body having a dust collecting chamber and a motor driving chamber, the dust

collecting chamber having a first inlet port and a first outlet port, the motor driving chamber being connected to the first outlet port; a suction brush connected to the cleaner body; and cyclone dust collecting means removably mounted in the dust collecting chamber for centrifuging and collecting contaminants entrained in air that is drawn in through the suction brush, wherein the cyclone dust collecting means include: a cover; a first cyclone body coupled to the cover, the first cyclone body having a second inlet port corresponding to the first inlet port for inducing the air and contaminants into a vortex and collecting contaminants of relatively large particles by centrifugation; a second cyclone body coupled to the cover and disposed inside the first cyclone body, the second cyclone body including a grille having a plurality of perforations through which reverse-ascending air from a lower part of the first cyclone body flows, and a third inlet port for inducing the air from the grille into a vortex; a lower door removably mounted on a lower end of the first cyclone body, the lower door having a second outlet port corresponding to the first outlet port; and an outlet pipe connected to the second outlet port for discharging the air from the second cyclone body.

According to a second aspect of the invention, there is provided an upright-type vacuum cleaner comprising: a cleaner body including a dust collecting chamber and a motor driving chamber, the dust collecting chamber having a first inlet port and a first outlet port, the motor driving chamber being connected to the first outlet port; a suction brush connected to the cleaner body; and cyclone dust collecting means removably mounted in the dust collecting chamber for collecting contaminants entrained in the air drawn in through the suction brush, wherein the cyclone dust collecting means include: a cyclone body having a second inlet port corresponding to the first inlet port, and a second outlet port corresponding to the first outlet port, the cyclone body inducing air which is drawn in through the second inlet port, together with contaminants into a vortex; and a dust

collecting receptacle removably disposed in the cyclone body for collecting contaminants entrained in the air by centrifugation of the vortex of air.

The invention also includes an upright-type comprising: a cleaner body including a dust collecting chamber and a motor driving chamber, the dust collecting chamber having a first inlet port and a first outlet port, the motor driving chamber being connected to the first outlet port; a suction brush connected to the cleaner body; and cyclone dust collecting means removably mounted in the dust collecting chamber for collecting contaminants entrained in the air drawn in through the suction brush, wherein the cyclone dust collecting means defines a closed cyclone chamber, and has: a second inlet port in registry with the first inlet port to provide air communication between the first inlet port and the cyclone chamber, and a second outlet port in registry with the first outlet port to provide air communication between the first outlet port and the cyclone chamber, the configuration of the cyclone dust collecting means being such that when air is drawn into the chamber through the second inlet port together with contaminants it is induced to form a vortex, the dust collecting means further comprising a removable portion for removing contaminants centrifugally collected by being entrained in the air forming the vortex.

The invention will now be described by way of example with reference to the drawings, in which:

Figure 1 is a perspective view of a first upright-type vacuum cleaner in accordance with the invention, having a cyclone dust collecting device;

Figure 2 is an exploded perspective view of the cyclone dust collecting device appearing in Figure 1;

Figure 3 is a sectional view of the cyclone dust collecting device of Figure 2 in an assembled state;

Figure 4 is a perspective view of a second upright-type vacuum cleaner in accordance with the invention, having a cyclone dust collecting device

Figure 5 is a sectional view of the cyclone dust collecting device appearing in Figure 4.

Referring firstly to Figure 1, an upright-type vacuum cleaner in accordance with the invention includes a cleaner body 10 having a dust collecting chamber 11 and a motor driving chamber 13, a suction brush or head 15 removably connected to the cleaner body 10, and a cyclone dust collecting device 17.

A first inlet port 11a is formed at one end of a suction pipe 12 which connects the suction brush 15 with the cyclone dust collecting device 17. A first outlet port 11b connected to the motor driving chamber 13 is formed in the dust collecting chamber 11. Preferably, the first inlet port 11a is formed in an upper portion of the dust collecting chamber 11, and the first outlet port 11b is formed in the bottom of the dust collecting chamber 11, as shown.

The cyclone dust collecting device 17 is detachably mounted in the dust collecting chamber 11 and is arranged to separate, using centrifugal force, contaminants from the air that is drawn in through the suction brush 15 and the suction pipe 12, and to collect the contaminants.

As shown in Figures 2 and 3, the cyclone dust collecting device 17 includes a circular cover 20, a first , outer cyclone body 30, a second, inner cyclone body 40, a lower door or cover 50, and an outlet pipe 60.

The outer cyclone body 30 is substantially cylindrical and has open upper and lower ends joined respectively to the cover 20 and cover 50. A second inlet port 31 in registry with the first inlet port 11a is formed in the outer cyclone body 30. The outer cyclone body 30, in cooperation with its upper cover 20, induces the air sucked through the second inlet port 31 to form a vortex and collects relatively large contaminant particles that are entrained in the air.

The inner cyclone body 40 is also substantially cylindrical and has open upper and lower ends. The inner cyclone body 40 is also joined to the cover 20 and fits inside of the first cyclone body 30. The cyclone body 40 includes a grille 41 with a plurality of perforations 41a formed therein. The perforations 41a enable air ascending in a reverse direction from the bottom of the outer cyclone body 30 to flow through and into the inner cyclone body 40. The inner cyclone body 40 further includes a third inlet port 43 for inducing the air which passes through the grille 41 to form a vortex so that additional contaminants entrained in the air are collected by the vortex-induced flow from the third inlet port channel 43.

The lower cover 50 is removably mounted (preferably by means of a screw thread) on the lower end of the outer cyclone body 30 and receives contaminants that have been collected in the outer and inner cyclone bodies 30 and 40, respectively. In the centre of the lower cover 50 there is formed a second outlet port 51 in registry with the first outlet port 11b.

An outlet pipe 60 is mounted on the lower door 50 and connected to the second outlet port 51. The outlet pipe 60 stands upright so as to extend axially inside the inner cyclone body 40, the top of the pipe 60 being spaced apart from the cover 20 by a predetermined distance. The spacing between the end of outlet pipe 60 and the cover

20 enables the air, which has ascended in a reverse direction from the bottom of the inner cyclone body 40 to the top, to be discharged through the second outlet port 51.

In addition, the cyclone dust collecting device 17 preferably includes an air collector 70 (see Figure 3) joined to the cover 20 and disposed between the outlet pipe 60 and the inner cyclone body 40. The air collector 70 induces the air that is sucked into the inner cyclone body 40 through the third inlet port 43 into a vortex, and exclusively guides the reverse-ascending air flow into the outlet pipe 60. The air collector 70 prevents the air that is drawn into the third inlet port 43 from flowing directly into the outlet pipe 60. Thus, the air collector 70 helps to centrifuge fine contaminants entrained in the air. The air collector 70 includes a skirt section 70a that gradually decreases in diameter in the direction of the lower door 50. This skirt section 70a prevents fine contaminants from entering the space between the air collector 70 and the outlet pipe 60 and escaping via the outlet pipe 60.

Referring to Figure 3, a preferred feature of the cleaner is a circulate path 14 connecting the motor driving chamber 13 and the suction brush 15. The air discharged from the second outlet port 51 enters the motor driving chamber 13, and then passes through the circulate path 14 into the suction brush 15. The air discharged through the suction brush 15 is then drawn in through the first inlet port 11a (see Figure 1) along with contaminants on the cleaning surface. Since the air is continuously circulated instead of being released to the outside atmosphere, it is not necessary to provide a vent in the cleaner body 10. In addition, the cleaning efficiency of the vacuum cleaner is enhanced due to continuous circulation resulting, in repeated collection of fine contaminants which were not collected by centrifugation during the cleaning process.

Still referring to Figure 3, we shall now describe the operation of the cleaner.

When power is supplied to the cleaner having the cyclone dust collecting device 17 in the dust collecting chamber 11, the motor, which is located in the motor chamber 13, operates to generate a suction force. The suction force draws air and entrained contaminants into the suction brush 15, the suction pipe 12, the first inlet port 11a, and the second inlet port 31 in that order. The air and the contaminants are induced into a vortex by the first cyclone body 30, acting in cooperation with the cover 20, and descend toward the lower cover 50. In this process, the relatively large particle contaminants are separated from the vortex of air by centrifugal force and collected on the lower cover 50.

When the air vortex reaches the bottom of the outer cyclone body 30, the air ascends in a reverse direction, passing through the grille 41 and into the third inlet port 43. The air drawn into the third inlet port 43 is once again induced into a diagonal vortex in the inner cyclone body 40. Accordingly, in the inner cyclone body 40, the fine contaminants entrained in the air are separated from the air by centrifugal force and fall to the bottom. The descending vortex of air in the inner cyclone body 40 once again ascends in a reverse direction when it reaches the bottom. The vortex of air ascends along the air collector 70 towards the upper portion of the inner cyclone body 40, and begins to descend again when it reaches the cover 20. This descending air is then sucked through the outlet pipe 60 and discharged through the second outlet port 51, the circulate path 14, and the motor driving chamber 13 in due order. Instead of being dispersed to the outside atmosphere, the discharged air is recirculated, being drawn back from the motor driving chamber 13 into the cyclone dust collecting device 17, along with additional contaminants on the cleaning surface, to repeat the process described above.

A second preferred embodiment of a cyclone dust collecting apparatus for an upright-type vacuum cleaner will now be described with reference to Figures 4 and 5.

Referring to Figure 4, the cleaner includes a cleaner body 10 having a dust collecting chamber 11 and a motor driving chamber 13, a suction brush 15 removably connected to the cleaner body 10, and a cyclone dust collecting device 18 for centrifuging and collecting contaminants entrained in the air that is drawn in through the suction brush 15.

The dust collecting chamber 11 includes a first inlet port 11a formed at one end of a suction pipe, which is connected to the suction brush 15, and a first outlet port 11b connected to the motor driving chamber 13. Preferably, the first inlet port 11a is formed in an upper portion of the dust collecting chamber 11, and the first outlet port 11b is formed in the bottom of the dust collecting chamber 11.

The cyclone dust collecting device 18 separates, using centrifugal force, contaminants from the air that is drawn in through the suction brush and collects the contaminants. The cyclone dust collecting device 18 includes a cyclone body 80 and a dust collecting receptacle 90 that is removably coupled to the cyclone body 80.

As shown in Figure 5, the cyclone body 80 consists of an upper body 81 and a lower body 83 joined together with screws. A second inlet port 81a corresponding to the first inlet port 11a is formed in the upper body 81. A second outlet port 83a corresponding to the first outlet port 11b is formed in the lower body 83. The cyclone body 80 as constructed above induces the air that is sucked through the second inlet port 81a into a vortex. The dust collecting receptacle 90 collects the contaminants that have been separated from the vortex of air by centrifugal force.

The lower body 83 of the cyclone body 80 has an outlet pipe 85 which connects the second outlet port 83a with the first outlet port 11b.

A substantially cylindrical grille 87 is formed in the dust collecting receptacle 90 and extends a predetermined distance towards the lower portion of the dust collecting receptacle 90. This grille 87 prevents any backflow of contaminants when the air is discharged through the second outlet port 83a. The upper portion of the grille 87 is formed between the upper body 81 and the lower body 83 in a shape as shown in Figure 5 to prevent the second inlet port 81a from communicating directly with the second outlet port 83a.

The operation of this second embodiment will now be described with reference to Figure 5.

When power is applied to the cleaner, the motor in the motor driving chamber 13 operates to generate a suction force. The suction force draws air and contaminants that are entrained therein into the suction brush 15, the first inlet port 11a, the second inlet port 81a, and the cyclone body 80 in due order. The drawn in air is induced into a vortex by the cyclone body 80 in cooperation with the dust collecting receptacle 90, and descends toward the bottom of the dust-collecting receptacle 90. In this process, the relatively large particle contaminants are separated from the vortex of air by centrifugal force and collected in the receptacle 90.

At the bottom of the receptacle 90, the vortex of air reverses direction and ascends. The reverse-ascending air is drawn into the second outlet port 83a through both the perforations 87a in the grille 87 and a lower opening 87b in the grille 87. Here, in the centre of the dust-collecting receptacle 90, the lighter air flows through the lower opening 87b of the grille 87, and the heavier air, which contains contaminants, ascends in the reverse direction along the inner circumference of the receptacle 90. The contaminants entrained in the heavier, reverse-ascending air along the inner

circumference of the dust collecting receptacle 90, are filtered out when the air passes through the perforations 87a in the grille 87, and the contaminants descend toward the bottom of the receptacle 90. Accordingly, the grille 87 prevents a backflow of the contaminants, and only the light and cleaner air is discharged through the second outlet port 83a.

The discharged air from the second outlet port 83a flows into the outlet pipe 85, the motor driving chamber 13, the suction brush 15 in due order. Instead of being released to the outside atmosphere, the air is drawn back into the cyclone dust collecting device 17 through the first inlet port 11a and the second inlet port 81a, together with additional contaminants on the cleaning surface.

The contaminants collected in the dust collecting receptacle 90 can be removed by separating the dust collecting receptacle 90 from the cyclone body 80 and disposing of the contaminants.

As described above, an upright-type vacuum cleaner in accordance with the present invention effectively collects contaminants by preventing a backflow of the contaminants that are collected in the dust collecting device.

Furthermore, since the discharged air is continuously recirculated instead of being dispersed into the outside atmosphere, it simplifies the appearance of the cleaner body, as there is no need for a vent. In addition, the efficiency with which contaminants are collected is improved and sanitation conditions are improved, by preventing dust dispersal with the discharged air.

CLAIMS

1. An upright-type vacuum cleaner comprising:

a cleaner body including a dust collecting chamber and a motor driving chamber, the dust collecting chamber having a first inlet port and a first outlet port, the motor driving chamber being connected to the first outlet port;

a suction brush connected to the cleaner body; and

cyclone dust collecting means removably mounted in the dust collecting chamber for centrifuging and collecting contaminants entrained in air drawn in through the suction brush, wherein the cyclone dust collecting means include:

a cover;

a first cyclone body coupled to the cover, the first cyclone body having a second inlet port corresponding to the first inlet port for inducing the air and contaminants into a vortex and collecting contaminants of relatively large particles by centrifugation;

a second cyclone body coupled to the cover and disposed inside the first cyclone body, the second cyclone body including a grille having a plurality of perforations through which reverse-ascending air from a lower part of the first cyclone body flows, and a third inlet port for inducing the air from the grille into a vortex;

a lower door removably mounted on a lower end of the first cyclone body, the lower door having a second outlet port corresponding to the first outlet port; and

an outlet pipe connected to the second outlet port for discharging the air from the second cyclone body.

2. A cleaner according to claim 1, further comprising an air collector coupled to the cover and disposed between the outlet pipe and the second cyclone body, the air collector be arranged to prevent the air drawn in through the third inlet port from flowing directly into the outlet pipe.

3. A cleaner according to claim 2, wherein the air collector further comprises a skirt section having a gradually decreasing diameter towards the lower door.

4. A cleaner according to any preceding claim, further comprising an air circulate path connecting the motor driving chamber with the suction brush, the air circulate path being arranged to recirculate the air discharged from the motor driving chamber into the suction brush and the first air inlet port.

5. A cleaner according to any preceding claim, wherein the first inlet port is formed in an upper portion of the dust collecting chamber, and the first outlet port is formed in the bottom of the dust collecting chamber.

6. An upright-type vacuum cleaner comprising:

a cleaner body including a dust collecting chamber and a motor driving chamber, the dust collecting chamber having a first inlet port and a first outlet port, the motor driving chamber being connected to the first outlet port;

a suction brush connected to the cleaner body; and

cyclone dust collecting means removably mounted in the dust collecting chamber for collecting contaminants entrained in the air drawn in through the suction brush, wherein the cyclone dust collecting means include:

a cyclone body having a second inlet port corresponding to the first inlet port, and a second outlet port corresponding to the first outlet port, the cyclone body inducing air which is drawn in through the second inlet port, together with contaminants into a vortex; and

a dust collecting receptacle removably disposed in the cyclone body for collecting contaminants entrained in the air by centrifugation of the vortex of air.

7. A cleaner according to claim 6, wherein the cyclone body comprises:

an upper body having a second inlet port, and

a lower body connected to the cyclone body and having a second outlet port.

8. A cleaner according to claim 6 or claim 7, wherein the first inlet port is formed in an upper portion of the dust collecting chamber, the first air outlet port is formed in the bottom of the dust collecting chamber, and an outlet pipe is disposed outside the cyclone body, the outlet pipe connecting the first outlet port with the second outlet port.

9. A cleaner according to claim 8, further comprising a grille having a plurality of perforations, the grille being connected to the second outlet port and formed in the dust collecting receptacle, and being arranged to prevent backflow of contaminants when air is drawn into the second outlet port.

10. An upright-type vacuum cleaner comprising:

a cleaner body including a dust collecting chamber and a motor driving chamber, the dust collecting chamber having a first inlet port and a first outlet port, the motor driving chamber being connected to the first outlet port;

a suction brush connected to the cleaner body; and

cyclone dust collecting means removably mounted in the dust collecting chamber for collecting contaminants entrained in the air drawn in through the suction brush, wherein the cyclone dust collecting means defines a closed cyclone chamber, and has:

a second inlet port in registry with the first inlet port to provide air communication between the first inlet port and the cyclone chamber, and

a second outlet port in registry with the first outlet port to provide air communication between the first outlet port and the cyclone chamber,

the configuration of the cyclone dust collecting means being such that when air is drawn into the chamber through the second inlet port together with contaminants it is induced to form a vortex,

the dust collecting means further comprising a removable portion for removing contaminants centrifugally collected by being entrained in the air forming the vortex.

11. An upright-type vacuum cleaner constructed and arranged substantially and herein described and shown in the drawings.

INVESTOR IN PEOPLE

Application No:	GB 0101041.2	**Examiner:**	Kathryn Orme
Claims searched:	1 - 5	**Date of search:**	29 March 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): A4F (FFD), B2P

Int Cl (Ed.7): A47L 09/16, B04C

Other: Online: WPI, EPODOC, PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2321181 A	(ELECTROLUX) whole document	
A	US 5779745	(KILSTROM) whole document	
A	US 4853008	(DYSON) whole document	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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